



# IMPLEMENTING ECOSYSTEM SERVICES IN THE COAST TO COAST CLIMATE CHALLENGE PROJECT

By Patrick Rosengren Danielsen



## Introduction

In early May 2019, the United Nations published a report on the status on biodiversity and ecosystems. The report concluded that 1 million of the estimated 8 million plant and animal species known today are threatened by extinction as a result of human activities such as urban expansion and agriculture (IPBES 2019). It raises concern about whether we are heading towards, or even are in the middle of the Sixth Mass Extinction on Earth. However, the report could also mark a shift in the way we talk about climate change and environmental protection. TV-avisen on DR1 featured a biologist, Carsten Rahbek, who talked about the consequences of loss of biodiversity on the ecosystems on which we all depend. He argued that ecosystems deliver services to humans but that these services would be lost if biodiversity continued to decrease.

The animals and plants make the ecosystems and the ecosystems are the ones which provide clean water, water circulation, nutrient circulation and ensure that we can breathe. They provide all the services needed for humanity to exist (Rahbek in TV-avisen, 6/5 2019, *my translation*).

What Rahbek talked about is the concept of ecosystem services (ES): The idea that ecosystems deliver goods and services, which are directly or indirectly beneficial to humans (MA 2005). It is an emerging concept, which recently has gained traction in academics, in policy-making and in practice. Some ES benefits to humans are obvious and these services are highly valued and protected. Clean drinking water, food, medicine, fuel and energy are all examples of this. These are direct services or even products, which nature provide us and which are extremely important for human existence and a good quality of life. However, other services are less tangible. These services are for instance aesthetics, cultural importance and recreation – services which are very valuable to humans but at the same time are much more difficult to quantify and assign value to. Consequently, many of these less tangible ES are neglected and excluded from decision-making processes, often resulting in unsustainable and environmentally detrimental policies and practices. Clearly, there is a need to be more aware of our dependence on ecosystems and include tools and concepts in our decisionmaking, which will ensure that our ecosystems thrive and continue to deliver the services on which we depend so much.

ES is a concept that helps identify these services, their importance and their value. As with other forms of climate change adaptation, it is much easier and cheaper to protect ecosystems now than

restoring them once they are damaged. As a tool for policy-making, ES has numerous practical applications: it can be used to measure the impact of climate change adaptation; make policy options more directly comparable; and provide a framework for giving environmental protection and sustainability more weight in decision-making, thereby promoting more sustainable management.

This report will examine the concept of ES in relation to the Coast to Coast Climate Challenge (C2C CC) project. It is an action plan for how the concept of ES could be implemented in the sub-projects and more generally in the municipalities.

## Purpose

This report is the product in my master thesis at Aarhus University, which was written in collaboration with the C2C CC. It is the second part of the thesis, with the first being a theoretical and methodological examination. This also means that the analysis, which forms the foundation of the findings and suggestions presented in this report, was carried out and presented in the first part of the thesis. This report, nevertheless, can be read independently from the first part of the thesis. The thesis builds on work previously done by C2C CC and is specifically a supplement to the folder on ES, which was written in November 2018 (C2C CC 2018). Consequently, this report will not be an indepth clarification of the underlying concepts as this was dealt with in the first part of thesis, but will rather focus on how ES could be used in the specific context.

In this report, I will present an action plan of how to implement and utilize ES in the C2C CC projects. To make valid suggestions, it was first necessary to understand the partners' knowledge, experience and attitudes towards ES to identify implementation barriers and to see how the concept could be utilized in their specific contexts. Therefore, I conducted interviews with nine of the project managers. Due to time constraints, I unfortunately could not speak with representatives from all projects, but I managed to get a suitable data sample, which allowed me to get a good idea about the different contexts in the project. Throughout the report, examples of practical applications of ES will be presented.

The report is part of C2C CC's action D3: *Monitoring of the project's socio-economic impact (incl. ecosystem functions)*. As a LIFE IP project, C2C CC is obliged to carry out an assessment of its impact on ES (EU LIFE n.d.). This report will lay the foundation for the continued work to develop a context specific method for assessing ES.

## **Ecosystem services**

Nature is fundamental for all human life and society. We depend on ecosystems, which deliver goods and services that are useful and essential to humans and our well-being. These services are what we mean when we talk about ES. It is a concept which illustrates our dependence on nature and can be used to make the value of ES visible.

Ecosystems provide us with clean drinking water, food, raw materials, medicine and energy. These services are grouped under the category of **provisional services**, i.e. goods and products, which are traditional commodities in markets and therefore have an economic value. Consequently, many of these services are highly valued and protected – although this is not always done sustainably. However, ecosystems also provide valuable services, which are not represented in traditional markets. These include aesthetics, recreation and tourism and nature's spiritual and religious significance. These **cultural services** are extremely hard to value and are thus often neglected.



Other services are more indirect, such as pollination, climate regulation, disease and pest control and flood prevention. These are **regulating services**, which we often take for granted as free, but would be extremely costly to replace or even in some cases be irreplaceable. The final category of services is **supporting services** that include nutrient cycling, soil formation and photosynthesis – services that provide the foundation for ecosystems to function and deliver the other services. These services are abstract and only indirectly impact us and, therefore, we don't tend to think about them.

#### The total economic value of ES:

In 1997, a group of researchers led by Robert Costanza published a seminal paper in which they estimated the total value of ES to be between \$16-54 *trillion* per year. To put this figure in to perspective, the annual global GWP in 1997 was \$18 trillion and in their estimation, ES were at least as valuable as all man-made capital and potentially three times as valuable. However, nature and ES are currently neglected in decision-making, at the expense of the environment. Our current forms of production and living is compromising our ecosystems' ability to continue to deliver these services on which we depend so heavily. ES can make these values visible and give nature the voice it needs.

## Ecosystem services in climate change adaptation

Climate change is not only causing rising temperatures and changes in precipitation and sea levels. It is also affecting biodiversity and thereby ecosystems' resilience and ability to perform ES. Biodiversity and healthy ecosystems are essential to climate change adaptation, acting as natural barriers and flood protection, cleaning our air and water while performing many other essential services very cost-effectively (Cools et al. 2009). However, the link between biodiversity, ES and climate change adaptation is often missed (Munang et al. 2013).

An Ecosystem-based Approach (EbA) highlights that link. It is an approach that "builds resilience and reduces the vulnerability of local communities to climate change" (Pérez et al. 2010). It is a way of integrating the sustainable use of biodiversity and ES in more comprehensive climate change adaptation strategies. Essentially, EbA is about maximizing the benefits we obtain from ES, while minimizing the negative impacts of human actions to biodiversity. According to Pérez et al. (2010), an EbA emphasizes that humans are part of ecosystems and makes the crucial link between social and ecological systems.

EbA is green infrastructure and nature-based solutions, and compared to traditional climate change adaptation focusing on grey infrastructure, EbA have been found to be more flexible and offer more cost-effective solutions (Jones et al., 2012). Additionally, these approaches have promoted more participatory practices, which makes them more socially sustainable and equitable and, furthermore, often lead to added benefits, such as improved biodiversity, more recreational opportunities and climate mitigation (Zölch et al. 2018).

## Natured-based watershed management in New York City

In the face of declining quality of New York's drinking water coming from the Catskill and Delaware river watersheds in the 1990s, the city ultimately had two options: option one was to build a new water filtration plant, which would cost \$6 billion to build and had annual operating expenses of \$300 million. The second option was to protect the watershed and regulate land use by either acquiring privately owned land or compensating the land owners for lost revenue, which in the most extreme scenario would cost \$2.7 billion in acquisition fees. The second option was a nature-based option for managing ecosystem services and was far more costeffective than the conventional grey infrastructure option of building a water filtration plant.

Source: Ranganathan et al. 2008



# **Operationalizing ecosystem services**

Much of the research on ES has centred around operationalizing the concept through developing Ecosystem Services Assessment (ESA) methods and tools. This has meant that more than 80 ecosystem service tools and methods for assessment has been developed and has led to the WRI publishing a guide on *selecting* which ESA tools to use in different decision-making contexts (Bullock & Ding 2018). Evidently, the field is confusing and there is a need to simplify. Therefore, I have reviewed several publications, which provide guidelines for how to carry out an ESA (EU LIFE, n.d.; Smith et al. 2013; Ranganathan et al. 2008; Burkhard et al. 2018; Forest Trends, Katoomba Group & UNEP 2008; Bullock & Ding 2018). The purpose of this review was to identify how an ESA could be utilized in a simple way, which fits well within the context of C2C CC and municipal work in general.





The first step in an ESA is to identify the relevant ES in the specific context. There are several classification systems, which can be used to aid the process. Most ESA guidelines recommend using CICES classification system since this is the most comprehensive. For simplicity, however, it might be more useful to use the categories identified in the Millennium Ecosystem Assessment report, which, though not as comprehensive, are more accessible. An ES is relevant if the project can have a direct or indirect impact on the service. Some of these might seem obvious, but having a systematic approach increases the likelihood of uncovering unforeseen links and impacts (Ranganathan et al. 2008).

The second and third steps are data collection and includes identifying indicators to assess the condition and pressures of the ES. The MAES framework has developed indicators to each specific ecosystem type and class. These indicators can be found in the 2<sup>nd</sup> MAES report (Maes et al. 2014) or on their website<sup>1</sup>. For instance, agricultural output's indicators would be area of agricultural lands in hectare and yield of food and feed crops measured in tonnes/ha/year. However, the amount and quality of data depends on what the assessment should be used for. If the purpose is advocacy or awareness raising, then the already available data in municipalities will suffice; however, if the purpose of the assessment is to support decision-making, then it is necessary to develop large data sets of high quality and complex models (EU LIFE n.d.).

#### The value of bees:

Several studies have recently attempted to estimate the economic value of bees and the value of natural pollination, which is essential for food production and wildflowers alike. Studies has estimated the value of pollination for just agricultural products, fruit and horticulture to be between DKK 600 million to 1 billion DKK in Denmark alone (Jensen 2018a)

The fourth step is to quantify the ES and assign value. Some guidelines argue that the valuation is optional. However, it should be noted that it is not necessarily a monetary valuation. There are several options for this. In MAES, for instance, the ES are given a standardized value between 0-5, where 0 means no relevant ES supply or demand and 5 means the maximum level of supply of ES of a given ecosystem type (EU LIFE n.d.). In PLASK, the value of ES is described quantitatively in

<sup>&</sup>lt;sup>1</sup> See <u>https://biodiversity.europa.eu/maes/mapping-ecosystems/indicators-for-ecosystem-services-across-ecosystems</u>

economic terms and qualitatively by describing the added benefits of the project. The tool thereby combines a narrow economic approach - is the project worth it and who should pay for it - with a broad focus on the parts of the project that benefit all but are difficult to quantify in economic terms. A third option is to conduct a monetary valuation of the services. There are two main methodological categories for economic valuation: stated preference methods and revealed preference methods. Stated preference methods include willingness-to-pay (WTP), which determine what people are willing to pay for preserving an ecosystem service, or willing to accept (WTA) in compensation for losing the service. Another stated preference method is contingent valuation, which sets up choice experiments with different ES to determine their value. Revealed preference methods are based on the actual behaviour of individuals rather than hypotheticals. Examples of revealed preference methods are travel-cost methods, which are widely used to determine the value of forests, parks and other recreational sites. The method estimates the value of the services by asking how much people have paid to get there, e.g. the cost of driving or getting there by public transportation. Another example is hedonic pricing methods, which determine the value of ES based on how it affects the value of other commodities. For instance, prices of houses near parks are significantly more expensive (Panduro 2018), while houses close to windmills are considerably less valuable (Jensen 2018b). By isolating variables, it is possible to determine the value of certain ES based on e.g. house prices. A final valuation method is alternate cost methods, which determine the value of ES based on what it would cost to replace them with man-made services.

Finally, the ecosystem service assessment needs to be disseminated. This could be in different contexts, such as a supplement in a decision-making process or perhaps more appropriately to raise awareness about the value of nature, biodiversity and ES. PLASK could be a useful tool in this process. Alternatively, an ecosystem benefit wheel could be useful in visualizing the impact of ES.

#### Kagsåparken's precipitation project, Rambøll

A study by Rambøll focussing on the added benefits of a climate change adaptation project in Gladsaxe municipality found that recreational options in the project area were estimated to be worth 6,800,000 DKK per year and the value of reducing obnoxious smells due to improved air quality was 8,700,000 DKK per year (Rambøll 2017).

## Findings

To understand how ES can be implemented in the C2C CC, I examined the partners' current level of knowledge about, experiences with and attitudes towards ES. I conducted nine interviews with project managers, which was the subject of the analysis. This is a common way of examining this phenomenon and a new sub-discipline in the research of ES focusing on the implementation of ES in municipal and local contexts has emerged in recent years: the "Planning for ES" research (Albert et al. 2014). My research therefore contributes to this area and many of the findings of this thesis are confirmed to be more broadly applicable. These findings will briefly be presented below.

I found that the partners were generally positive towards the ES but also identified several barriers for the implementation of the concept. **First**, complexity was a general theme in the interviews and presented barriers to the implementation in several ways. Unfamiliarity was identified as a significant barrier to the implementation. Some of the respondents did not know ES well and many had difficulties in separating the concept from other sustainability agendas and seeing how the concept could be useful in climate change adaptation. This showed that there is a *need* for information, but there was also a *request* for information. They wanted to know more and thought that this way of thinking could be valuable if operationalized to provide more efficient and holistic solutions. Several other studies have also identified lack of knowledge as a barrier (see Albert et al. 2014; Sandström et al. 2006; Beery et al. 2016).

There were also different notions of complexity in the interviews. Some respondents argued that municipal environmental management and environmentalism in general has become much more complex in recent years. The field is constantly changing and new agendas, tools and methods are emerging – making the area a jungle of concepts. These respondents felt that the field is becoming overwhelming and that it has become saturated with agendas. Similarly, others argued that environmental management in the municipalities has become more complex and challenging in recent years. According to them, there is a need to simplify and if ES can simplify processes and provide a more nuanced way to talk about the complex issues of nature and biodiversity, it can be a useful tool. Others argued that ES as a concept and term is complex, i.e. that is too academic, abstract and technical term and is not suited to the municipal context and their daily work:

It works well in professional contexts but it is not something that works well in our everyday work where we are in dialogue with citizens or are trying to convince the media or politicians [...] It somehow is too technical (Coordinator, Randers, 29/5 2019)

They argued that while ES is a useful tool in professional contexts, it is not very useful in contexts of non-experts, for instance, in dialogues with citizens, the media or politicians.

**Second**, some respondents argued that ES does not belong at the municipal level. They argued that it is exactly the complexity of the concept that makes it unsuitable to the municipal level. Municipalities employ generalists, rather than the specialists and experts, who are employed by the state. Also, municipalities operate at a different scale than the state and the regions, which are focused on coordination and broad strategic work whereas the municipalities are more focused on implementation and concrete actions. Therefore, it might not make sense to include an abstract concept like ES, but rather be more concrete.

Third, some partners had concerns about the economic aspects of ES and especially feared that monetary valuations would lead to commodification of nature, i.e. that nature becomes a commodity that can be bought and sold in markets. This is also a common finding in other studies, which similarly identified reluctance towards monetary valuations with municipal employees (Wamsler 2015; Albert et al. 2014). More research is needed to make conclusions about the sustainability of the economically founded methods like Payments for Ecosystem Service (PES) markets and the effects of monetary valuations for sustainability (Gómez-Baggethun 2017). It is a valid concern and it means that not all aspects of ES should be readily accepted without scepticism. It means that we need to think about which aspects of ES could be useful and which we should avoid.

#### Ecosystem services in Swedish municipal planning

In 2012, the Swedish government decided that all Swedish municipalities should integrate the importance of biodiversity and the value of ecosystem services in planning and other areas where it is relevant (Delshammar 2015). This should be implemented no later than by 2018. As such it is an example of top-down implementation through national legislation. But it is also an attempt to implement the concept at the strategic level through municipal plans and urban planning and has made Sweden the European leader in the area. Malmö, for instance, has made explicit references to ecosystem services since 2014 and a study found that municipal planners view ecosystem services as an underlying theme for much of their professional work (Shubert 2018). Furthermore, the increased use of ecosystem services was linked to a more holistic approach in planning.



**Fourth**, some respondents feared that the concept would merely be empty words. They argued that sustainability agendas, and especially the United Nations' Sustainable Development Goals (SDGs), have led to a situation where we focus more and more on developing new strategies but neglect developing new methods for monitoring whether we are meeting these goals:

... it looks like municipalities mention in their projects: 'well, this contributes to SDG 6, 7, 8, 9 and 10.' Well, that is very easy to say but how much does it really contribute to these? I don't know (Coordinator, Horsens, 29/5 2019)

These respondents argued that we need tools for monitoring the progress of climate change adaptation projects and similar projects contributing to sustainability. This is a need that ES could fill and the concept is perhaps most commonly used as exactly a monitoring tool through ecosystem service assessments.

All of these considerations have implications for first of all how the concept can be implemented, and secondly, which *aspects* of the concept that can be utilized. For instance, because of the concerns about the complexity of ES, it is not necessarily the best idea to use the common ESA tools like MAES, TEEB or IPBES. These are very complex to use and require large quantity of data and further, it might not be necessary to conduct such large-scale and comprehensive assessments to utilize ES in a local context. Other concerns, for instance, those relating to commodification means that PES-markets and other ES methods, which are centred around economics, might not be suitable to the context. Instead, it makes more sense to focus on how ES creates other values or added benefits, which does not have to be monetized.

The partners also had several suggestions as to how the concept could be implemented. One respondent argued that it should be implemented at the municipalities' executive level because as a decision-making tool at the strategic level, the decisions would need this mandate. Another respondent argued that the concept did not belong at the local level, but rather should stay at the state level, cf. the discussion about complexity and scales at different administrative levels. A third respondent argued that the concept should be implemented top-down through national legislation requiring municipalities to incorporate ES in existing policies and planning practices – similar to how is has been implemented in Sweden. But most importantly, several of the respondents suggested that the most logical and effective way to implement ES would be through the municipal plans. The only municipality in this examination who already actively use ES is Norddjurs. They implemented the concept through the municipal plans, which meant that it was embedded both in the local projects and at the strategic level (Coordinator, Norddjurs, 9/5 2019). This idea is also an implementation route commonly studied in ES planning research. However, there is still a need for further research in the area to identify how effective this is and how to accomplish it in practice.

## Suggestions and plan of actions

ES is not yet a well-known and widely used concept. This, however, is changing due to increased attention in policy circles and academic circles alike. The environmental agenda is ever changing and with the latest IPCC report, it seems like biodiversity is going to be the next focus. However, it is also evident that we lack methods and tools to sustainably manage nature and biodiversity. And we need ways to communicating the importance of these efforts to decision makers, the media and to citizens. While C2C CC is a climate change adaptation project, there are significant links between biodiversity and climate change adaptation. Climate change adaptation is about managing the effects of current climate change and building resilience towards future climate changes and biodiversity is essential when building resilience. ES could be a way to illustrate the value of nature and give these concerns a voice in decision making. It can also be a useful tool in measuring impact of the projects and ensuring that the projects are more holistic and bring added benefits besides flood protection and so on. Based on my research, I have five suggestions for how to work more actively with ES in the future (see figure 2).

However, it is important to stress that the C2C CC project operates at different levels: the municipal level, which is local, specific and focused on operation and the regional level, which is broad, strategic and focused on coordination. Therefore, the concept of ES should be used differently in these different contexts. Some respondents argued that the term is not suited for discussions with non-experts. Furthermore, given municipalities' limited resources it is probably not likely that the concept will be implemented broadly in the municipalities' decision-making for the time being. However, it has its merits as a tool for articulating our dependence on and the importance of biodiversity and can be used to illustrate the added values of the projects' climate change adaptation efforts.

![](_page_14_Figure_0.jpeg)

![](_page_14_Figure_1.jpeg)

**First**, continue developing new informational material on the subject. ES is a new concept and has not been widely implemented, but as this report shows, there are more and more examples of the concept being used in a wide variety of contexts, ranging from the state level, to regional assessments and all the way down to the micro-level in individual projects. However, my research also showed that while many of the partners recognized the term, they did not have deep understanding of the concept and only one municipality is currently working actively with the concept. So, we need more examples of how the concept can be operationalized and used in the projects and in the municipalities. This report and the workshop in June 2019 are the first steps and have shown how others have used the concept and can act as a source of inspiration. The region should continue to develop workshops in the area and seek out opportunities for study trips. An obvious destination would be Sweden who is the European leader in the implementation of ES at the local level.

Still, it is also important to stress that ES is not one thing, but covers many different methods and tools. Some of the respondents had concerns about the economic elements of the concept and feared that it would lead to commodification, i.e. nature would become a commodity which can be bought and sold in markets. It is a concern, which is also mentioned by municipal planners in other studies and is also a common critique in academics. Commodification can lead to unequal access to essential ES (Gomés-Baggethun & Ruiz-Pérez 2011). We still do not know the environmental impact of the most market-oriented ES methods such as PES markets yet, but there is a possibility that the

concept can be misused to promote unsustainable neoliberal environmental policies (Gómez-Baggethun 2017). For these reasons, C2C CC should avoid implementing the aspects of ES, which are heavily influenced by economics, such as PES markets. However, ES is much more than PES markets and economic valuations. A significant part of ES is exactly to expand our notion of value and promote a value-pluralism. We need to be aware of which aspects of ES we want to promote and utilize. It is not the market-oriented parts of ES that should be implemented in C2C CC. Rather, it is the aspects, which broadens our perception of value and highlights the value of nature. This value can be communicated in economic terms but it does not have to.

Second, PLASK should be used as a tool for assessing the project's impact on ES. Many of the partners requested simplicity and argued that a complex tool would not be effective and useful in the municipal context. Complexity was a significant theme in many of the interviews and many argued that ES is a complex concept, which is confusing and therefore they do not use the concept. Others similarly argued that ES is not suited to the municipal context because municipalities generally employ generalists rather than specialists. Admittedly, ES assessment tools like MAES are notoriously difficult to use and require large amounts of high quality data. However, PLASK is a much simpler tool, which was developed by the Danish Environmental Protection Agency to estimate the socioeconomic benefits and impact of climate change adaptation projects. It is free to use and very user-friendly. PLASK is a useful tool for starting to think differently about ES and decision-making. However, the tool has its limitations and with the simplicity you sacrifice accuracy. But as a tool for beginning to work actively with ES and for illustrating the value it has its merits. Later it might make sense to use the more comprehensive ESA tools and if the C2C CC is to conduct an assessment of the projects impact on ES, then it is necessary to use these more comprehensive tools and in particular MAES. But as a tool for raising awareness, PLASK would be useful.

**Third,** ES should be mainstreamed into the decision-making tools that are being developed in the projects. C11 Randers Fjord and C15 Hedensted & Tøring, for instance, are developing decision-making tools for areal planning, which also promotes added benefits. C11 Randers Fjord wants to develop a tool that estimates the socioeconomic impacts of flooding while incorporating how to develop climate change adaptation solutions, which bring added values. They furthermore want a tool that can show the value of nature. C15 Hedensted and Tørring are similarly developing a decision-making tool for areal planning in collaboration with Herning and Holstebro from C13. Including ES in these decision-making tools would broaden the scope of the tools and would make the solutions

that are developed more holistic and sustainable. Rather than having a narrow focus on risk management and assets, including the ideas of ES would make it more participatory and promote more socially and ecologically equitable notions of values. It would also mean that the solutions should focus more on nature-based solutions and green infrastructure, rather than conventional climate change adaptation and "grey infrastructure". This has also been found to be more flexible and costeffective compared to conventional climate change adaptation (Jones et al. 2012; Zölch et al. 2018). Including ES in these decision-making tools is a way of mainstreaming the concept into other institutions and policy areas, meaning that rather than implementing ES as an independent policy tool, it is rather implemented in already existing practices and policies. This is an implementation route commonly recommended in the scientific literature on implementing ES (Thompson et al. 2019; Sitas et al. 2014; Wamsler 2015; Shubert et al. 2018).

#### Estimating the cost of improving biodiversity in Denmark:

A study of biodiversity management in Denmark estimated the total cost of improving biodiversity protection to be 850 million DKK annually. The analysis showed that it would be most cost-effectively to focus on forests and decommission forestry, while establishing new forest areas. The study paved the way for *Naturpakken* in 2016, in which 1,300 km<sup>2</sup> forests would be established (Højgård Petersen & Rahbek 2018)

**Fourth,** the concept should be implemented through the municipal plans. This suggestion for how to implement ES was brought up by several of the respondents. Norddjurs was the only of the nine municipalities in the study who already worked with ES and they had implemented the concept exactly through the municipal plans. They argued that this included ES in the individual projects, while also embedding the concept at the strategic level. Other studies have argued that there is a need to include ES at the strategic level and that this is one of the largest barriers to the implementation and larger applicability of the concept (Beery et al. 2016; Cortinovis & Geneletti 2018). Implementing ES through the municipal plans would solve this need and would be a leap forward in the implementation. This would also make the region of Central Denmark among the world leaders in the area. One of the respondents argued that the municipal plans so far have been quite traditional in

how they are developed and how they operate. However, they are currently trying to change this and make the municipal plans a more contemporary tool, which is more suited to address the challenges we are facing today in environmental public management at the municipal level. The respondent argued that this process might offer an opportunity to incorporate ES in the municipal plans and that this would spur the implementation tremendously. The municipal plans are powerful tools, which sets out the goals and dictate how to meet these goals. However, as other studies have shown, the explicit use of ES in municipal and urban plans are not necessarily an indicator of the actual use of the concept (Thompson et al. 2019). To truly be impactful, ES needs to be viewed as a valuable tool in the municipalities. Otherwise, the concept will not be accepted in practice. There is still some way to go here and there is a need for further research to establish exactly how this process could be done most efficiently and how the uptake would be best supported.

**Finally**, ES should be integrated in the region's holistic planning project. Unlike the other suggestions, this final suggestion relates to the regional level. Furthermore, it goes beyond the C2C CC project and this suggestion is aimed at one of the forthcoming complementary projects, which is being developed by the region and the municipalities. The project is going to be a part of the reform to promote a multifunctional areal planning in Denmark following the proposal from Landbrug & Fødevarer (L&F) and Danmarks Naturfredningsforening (DN) to decommission 100,000 hectares of impoverished agricultural land and instead establish more nature. The region's holistic planning project will develop a tool to identify which areas would bring the most ecological impacts and should consequently be decommissioned. This project is in large parts built around the concepts of ES and therefore already includes the concept implicitly. For instance, the proposal by L&F and DN stresses that the multifunctional areal planning should be participatory and bottom-up by including plot owners, civil society and interested citizens. Studies have found that participatory decisionmaking are more effective and legitimizes the decisions taken (Langemeyer et al. 2018) and this is an important element of an EbA. Including ES in this tool would make the tool more broadly focussed and ensure that ecological and social values also have a voice. In the proposal by L&F and DN, they argue that before the solution can be operationalized, we need a more technical understanding of the impacts of different forms of nature conservation and management, and to understand which solutions will increase the value of the nature in the areas (L&F and DN 2019). ES is a tool, which could be utilized in this context for exactly that purpose. Assessments of ES are widely used to form the basis for understanding the impact of solutions and projects and to identify the value of nature. As such ES is perfect for this context.

## Conclusion

Ecosystem services provide the foundation, which enable life and human society. However, these services are often neglected in decision-making because they are intangible, visible and consequently perceived as less salient than other agendas in policy-making. However, the current ecological crisis means that the value of these services needs to be incorporated in decision-making and mainstreamed into existing planning policies and practices. ES is a concept that enables us to identify and articulate this value, while also being a tool for measuring and monitoring sustainability. Yet, there is a gap between ES research and management, which means that implementation has been slow and cumbersome (Sitas 2014). This thesis and report has examined how ES can be implemented in the Coast to Coast Climate Challenge project. During the research process, however, the question increasingly became *whether* ES should be implemented at the municipal level and if so, *which aspects* of ES should then be implemented.

C2C CC is unique in that it operates at two levels. A discussion of scale and levels was therefore an important theme in the research, and led some partners to argue that the concept of ES was too complex and abstract for the municipal level. They argued that the scale at which the state, the region and the municipals operate at are widely different and that ES was more suited to the abstract and technical context of these upper administrative levels, which sets out the broad policy lines. The municipalities, on the other hand, are more concrete and focus on implementing these broad policies. In this process, some partners did not find ES helpful. Therefore, ES should be implemented differently at the two levels and it might be premature for ES to be broadly implemented in decision-making in the municipalities. On the other hand, it can act as a supplementary tool for raising awareness, expanding our notion of value and making nature more visible in decision-making. Therefore, it makes sense to mainstream ES into existing planning practices and decision-making tools, which are being developed in the C2C CC project and at the region.

Yet, ES is not one single entity and the analysis also revealed that not all aspects of the concept should be implemented. Several of the partners were concerned about ES leading to commodification and instrumental views of nature, and thus, unsustainable and detrimental environmental policies and practices. This is a common concern and reluctance towards monetary valuations has also been found in several other studies of municipal employees (Albert et al. 2014; Wamsler 2015). For the implementation, this means that the aspects of ES, which are heavily influenced by economics should not be included. PES-markets and monetary valuations does not seem appropriate in the

light of these concerns and should be avoided. Consequently, ES should promote the inclusion of other values, such as ecological and social values, in decision-making and make these processes more transparent and participatory.

Implementation was a general theme in the thesis and the partners made several suggestions for how this could be achieved. The most significant was to implement ES through the municipal plans. This had already been done successfully in Norddjurs and they argued that this embeds ES both at the local projects and at the strategic level. ES is generally lacking at the strategic level, which hinders its uptake and more broad applications (Cortinovis & Geneletti 2018; Beery et al. 2016). The municipal plans offer a powerful medium for change and would spur the implementation of ES considerably. According to a respondent, the municipal plans work quite traditionally, and are not always suited to manage the current challenges. Including ES would make them more contemporary and provide tools to deal with these challenges more effectively. However, more research is needed to establish how ES could most effectively be implemented in the municipal plans and to determine the ecological and social effects of this.

We are facing an ecological crisis, which we are ill-equipped to manage. However, ES offers tools for holistic planning and for giving nature and biodiversity the voice it needs in decision-making. While the concept has flaws and is still under development, it has potential. ES provides much of the resilience, which CCA seeks to increase and it is therefore important to include these considerations in how we manage CCA and environmental management. This report has outlined suggestions for how this could be achieved.

## **References**, report

- Albert, C., Aronson, J., Fürst, C., Opdam, P. (2014) Integrating ecosystem services in landscape planning: requirements, approaches, and impacts. *Landscape Ecol* 29, 1277-1285.
- Beery, T., Stålhammar, S., Jönsson, K., Wamsler, C., Bramryd, T., Brink, E., Ekelund, N., Johansson, M., Palo, T., Shubert, P. (2016) Perceptions of the ecosystem services concept: Opportunities and challenges in the Swedish municipal context. *Ecosystem Services* 17, 123-130.
- Bullock, J. & Ding, H. (2018) *A guide to selecting ecosystem service models for decision-making*. Washington DC: World Resources Institute.
- Burkhard, B., Santos-Martin, F., Nedkov, S., Maes, J. (2018) An operational framework for integrated Mapping and Assessment of Ecosystems and their Services (MAES). *One Ecosystem* 3.
- C2C CC (2018) Klima og økosystemtjenester hvordan værdisætter vi vores økosystemer og de ydelser, der giver os? [online] Available at: <u>http://www.c2ccc.eu/siteassets/c2ccc/falles-mate-</u> riale/danske-foldere/k2\_4511\_hafte\_a5-til-tryk.pdf [Accessed 19 August 2019].
- Colls, A., Ash, N., and Ikkala, N. (2009). *Ecosystem-based Adaptation: a natural response to climate change*. Gland: IUCN.
- Cortinovis, C., Geneletti, D. (2018) Ecosystem services in urban plans: What is there, and what is still needed for better decisions. *Land Use Policy* 70, 298-312.
- Delshammar, T. (2015) Ecosystem Services in Municipal Spatial Planning: Progress Report, Sweden 2015. Uppsala: Sveriges lantbruksuniversitet.
- DR1 (2019) TV-avisen 18:30 1 million arter er truet af udryddelse [tv programme]. 6 May. Available at: <u>https://www.dr.dk/tv/se/tv-avisen-med-sporten/tv-avisen-23/tv-avisen-2019-05-06-18-29#!/04:05</u> [Accessed 1 June 2019].
- EU LIFE (n.d.) Assessing ecosystems and their services in LIFE projects. Available at: <u>https://ec.eu-ropa.eu/easme/sites/easme-site/files/life\_ecosystem\_services\_guidance.pdf</u> [Accessed 24 May 2019].
- Forest Trends, The Katoomba Group & UNEP (2008) *Payments for ecosystem services getting started: a primer*. Forest Trends, The Katoomba Group and UNEP: London.
- Gómez-Baggethun, E., Ruiz-Pérez, M. (2011) Economic valuation and the commodification of ecosystem services. *Progress in Physical Geography* 35, 613-628.
- Gómez-Baggethun, E. (2017) Ecosystem Services. In C. Spash (ed.) *Routledge Handbook in Ecological Economics: Nature and Society*. London and New York: Routledge, 445-453.

- Højgård Petersen, A., Rahbek, C. (2018) Hvordan bevares biodiversiteten omkostningseffektivt i Danmark? In J. S. Schou, J. Jensen, J. Thorsen (eds.) Sæt Pris på Naturen. København: København Universitet, 137-141.
- IPBES (2019) Summary for policymakers of the global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. Bonn: IPBES.
- Jensen, J. (2018a) Naturens ikke-værdisatte ydelser. In J. S. Schou, J. Jensen, J. Thorsen (eds.) *Sæt Pris på Naturen*. København: København Universitet, 81-83.
- Jensen, C. U. (2018b) Vindmøller, udsigt og støj. In J. S. Schou, J. Jensen, J. Thorsen (eds.) *Sæt Pris på Naturen*. København: København Universitet, 117-122.
- Jones, H., Hole, D., Zavaleta, E. (2012) Harnessing nature to help people adapt to climate change. *Nature Climate Change* 2, 504-509.
- Landbrug og Fødevarer & Danmarks Naturfredningsforening (2019) *Fælles løsninger for natur og landbrug*. [online] Available at: <u>https://www.faellesloesninger.dk/me-dia/35273/f%C3%A6lles-l%C3%B8sninger-endelig.pdf</u> [Accessed 27 August 2019].
- Langemeyer, J., Palomo, I., Baraibar, S., Gómez-Baggethun, E. (2018) Participatory multi-criteria decision aid: Operationalizing an integrated assessment of ecosystem services. *Ecosystem Ser*vices 30, 49-60.
- Maes, J. et al. (2014) Mapping and Assessment of Ecosystems and their Services: Indicators for ecosystem assessments under Action 5 of the EU Biodiversity Strategy to 2020. *European Union Technical Report*.
- Munang, R., Thiaw, I., Alverson, K., Liu, J., Han, Z. (2013) The role of ecosystem services in climate change adaptation and disaster risk reduction. *Current Opinion on Environmental Sustainability* 5, 47-52.
- Panduro, T. E. (2018) Værdien af rekreative områder nær ved boliger. In J. S. Schou, J. Jensen, J. Thorsen (eds.) *Sæt Pris på Naturen*. København: København Universitet, 33-37.
- Pérez, A., Férnandez, B., Gatti, R. (2010) Building Resilience to Climate Change Ecosystem-based adaptation and lessons from the field. Gland: IUCN.
- Rambøll (2017) Økosystemtjenester og klimatilpasning: Kagsåparkens regnvandsprojekt. Slideshare, 30 March. Available at: <u>http://www.vandibyer.dk/media/1619/kristine-kjoerup-rasmussen-ramboell.pdf</u> [Accessed 28 August 2019].
- Ranganathan, J., Raudsepp-Hearne, C., Lucas, N., Irwin, F., Zurek, M., Bennett, K., Ash, N., West, P. (2008) *Ecosystem Services: A guide for Decision Makers*. Washington DC: World Resource Institute.

- Sandström, U., Angelstam, P., Khakee, A. (2006) Urban comprehensive planning identifying barriers for the maintenance of functional habitat networks. *Landscape and Urban Planning* 75, 43-57.
- Shubert, P., Ekelund, N., Beery, T., Wamsler, C., Jönsson, K., Roth, A., Stålhammar, S., Bramryd, T., Johansson, M., Palo. T. (2018) Implementation of the ecosystem services approach in Swedish municipal planning. *Journal of Environmental Policy and Planning* 20, 298-312.
- Sitas, N., Prozesky, H., Esler, K. (2014) Opportunities and challenges for mainstreaming ecosystem services in development planning: perspectives from a landscape level. *Landscape Ecol* 29, 1315–1331.
- Sitas, N. (2014) *Opportunities and challenges for mainstreaming ecosystem services in decision making*. PhD thesis. Stellenbosch: Stellenbosch University, 2014.
- Smith, S., Rowcroft, P., Everard, M., Couldrick, L., Reed, M., Rogers, H., Quick, T., Eves, C. and White, C. (2013). *Payments for Ecosystem Services: A Best Practice Guide*. Defra: London.
- Thompson, K., Sherren, K., Duinker, P. (2019) The use of ecosystem services concepts in Canadian municipal plans. *Ecosystem Services* 38.
- Wamsler, C. (2015) Mainstreaming ecosystem-based adaptation: transformation toward sustainability in urban governance and planning. *Ecology and Society* 20(2).
- Zölch, T., Wamsler, C., Pauliet, S. (2018) Integrating the ecosystem-based approach into municipal climate adaptation strategies: The case of Germany. *Journal of Cleaner Production* 170, 966-977.